# 4.4 GEOLOGY AND SOILS

This section of the EIR evaluates potential impacts associated with geology and soils resulting from implementation of the proposed project. The following discussion is based on the Report of Preliminary Geotechnical Investigation (Geotechnical Exploration, Inc. 2004), Interim Report of Site Conditions and Preliminary Opinions (Geotechnical Exploration, Inc. 2018), and Report of Geotechnical Investigation Update (Geotechnical Exploration, Inc. 2019), which are included as Appendix F of this EIR.

## 4.4.1 Existing Conditions

### 4.4.1.1 Geologic Setting

The project site is located within the coastal plain portion of the Peninsular Ranges Geomorphic Province (Province), a region characterized by relatively uplifted northwest-trending structural blocks and relatively down-dropped intervening fault zones and alluvial valleys. The Province extends approximately 920 miles from the Los Angeles Basin to the southern tip of Baja California and varies in width from approximately 30 to 100 miles. Bedrock units in the Province include Jurassic (approximately 144 million to 206 million years old) metavolcanic and metasedimentary rocks, and Cretaceous (approximately 65 to 144 million years old) igneous rocks of the Southern California Batholith (a large igneous intrusive body). The coastal plain area in San Diego County encompasses a series of stair-stepped marine terraces that increase in age from west to east, and typically include a sequence of relatively undisturbed and non-conformable (i.e., not in direct chronologic sequence) upper Cretaceous through Pleistocene (between approximately 11,000 and 2 million years old) marine and non-marine sedimentary strata. These deposits have been dissected, in general, by west-flowing drainages to produce the characteristic canyon and mesa topographic features present today in western San Diego County, as well as deposit surficial materials such as alluvium, colluvium, and topsoil. Additional description of on-site surficial and formational deposits is provided below under the discussion of stratigraphy.

The project site is located within the seismically active San Diego region, which is on the eastern boundary of the Southern California Continental Borderland, part of the Province. This region is part of a broad tectonic boundary between the North American and Pacific Plates. The actual plate boundary is characterized by a complex system of active, major, right-lateral strike-slip faults trending northwest/ southeast. This fault system extends eastward to the San Andreas Fault (approximately 84 miles from La Mesa) and westward to the San Clemente Fault (approximately 72 miles offshore from La Mesa).

### 4.4.1.2 Topography

Topographically, the project site is relatively level with an approximate on-site elevation of 410 feet AMSL. The project site is currently developed as an RV resort and is largely covered with concrete pads and asphalt used for vehicle parking and driveways. Alvarado Creek traverses the site and borders a portion of the southern edge of the site and flows from east to west.

### 4.4.1.3 Stratigraphy

Geologic and surficial units identified within the project site include artificial fill, stream deposits, and Stadium Conglomerate Formation.

### Artificial Fill

Since almost the entire project site has been previously graded and/or excavated during development of the RV resort, surface soils are highly disturbed. The surface of the project site is covered by a relatively shallow layer of artificial fill soils that extend to a depth of two to three feet. The fill consists of loose to medium dense and consists of damp, red-brown to gray-brown, silty, fine to medium and fine to coarse sand with pebbles and cobbles. The shallow fill soils are considered to have a low expansion potential. These fill soils are not suitable in their current condition for bearing support of development.

### Stream Deposits

The fill soils along the southern perimeter of the project site are underlain by stream deposits to an approximate depth of nine feet below the present surface grade. The stream deposits consist of a medium dense, wet, tan-gray and orange-brown, fine to coarse sand with abundant cobbles and boulders (to 14 inches in diameter). Stream deposits are considered to have low expansion potential. These stream deposit soils are not suitable in their current condition for bearing support.

### Stadium Conglomerate Formation

The entire site is underlain by dense cobble conglomerate formational material of the Tertiary Stadium Conglomerate Formation at depths below three feet. These formational soils are considered to have a negligible to very low liquefaction potential and low consolidation and expansion potential characteristics.

### 4.4.1.4 Faulting and Seismicity

There are no known active or potentially active faults are located at the project site (Geotechnical Exploration, Inc. 2019). The closest active fault to the project site is the Rose Canyon fault, which is located 7.4 miles west of the site. Active faults are defined as those exhibiting historic seismicity or displacement of Holocene (less than approximately 11,000 years old) materials, while potentially active faults have no historic seismicity and displace Pleistocene but not Holocene strata.

Five major active faults are located within approximately 60 miles of the site, as shown in Table 4.4-1, *Summary of Regional Fault Locations and Earthquake Magnitudes*. Due to its proximity, the Rose Canyon fault is considered the dominant source of potential seismic-related hazards at the project site.

**Table 4.4-1**
**SUMMARY OF REGIONAL FAULT LOCATIONS AND EARTHQUAKE MAGNITUDES**

| Fault Name | Distance from Project Site (miles) | Direction from Project Site | Maximum Earthquake Magnitude (M) |
|---|---|---|---|
| Rose Canyon | 7.4 | W | 7.5 |
| Coronado Bank | 21.3 | SW | 7.0 |
| Elsinore | 34 | NE | 7.1 |
| Newport-Inglewood | 35 | NW | 7.4 |
| San Jacinto | 55 | NE | 7.2 |

Source: Geotechnical Exploration, Inc. 2019
W=West; SW=Southwest; NE=Northeast; NW=Northwest

#### 4.4.1.5 Groundwater

Groundwater was encountered at a depth of three feet at one of the exploratory trenches along the southern perimeter of the project site, adjacent to Alvarado Creek and two exploratory borings in the western portion of the site.

### 4.4.2 Regulatory Setting

#### 4.4.2.1 State

##### California Alquist-Priolo Earthquake Fault Zoning Act

The California Alquist-Priolo Earthquake Fault Zoning Act of 1972 (PRC Section 2621 et seq.) is intended to prevent the construction of buildings used for human occupancy on the surface trace of active faults. The law requires the State Geologist to establish regulatory zones known as Earthquake Fault Zones (previously called Special Studies Zones and Fault-Rupture Hazard Zones) around the surface traces of active faults, and to distribute maps of these zones to all affected cities, counties, and state agencies. The Act also requires completion of a geologic investigation prior to project approval, to demonstrate that applicable structures will not be constructed across active faults and/or that appropriate setbacks from such faults (generally 50 feet) are included in the project design.

##### California Seismic Hazards Mapping Act

The California Seismic Hazards Mapping Act of 1990 (PRC Division 2, Chapter 7.8, Section 2690 et seq.) provides a statewide seismic hazard mapping and technical advisory program to assist local governments in protecting public health and safety relative to seismic hazards other than surface fault rupture, which is covered by the Alquist-Priolo Earthquake Fault Zoning Act (described above). This Act is intended to protect the public from the effects of strong ground shaking, ground failure, liquefaction, earthquake-induced landslides, and other hazards caused by earthquakes. The Act provides direction and funding for the State Geologist to compile seismic hazard maps and to make those maps available to local governments. The Act, along with related standards in the Seismic Hazards Mapping Regulations (CCR Title 14, Division 2, Chapter 8, Article 10, Section 3270 et seq.), also directs local governments to require the completion and review of appropriate geotechnical studies prior to approving development projects. These requirements are implemented on a local level through means such as general plan directives and regulatory ordinances (with applicable City standards outlined below). Special Publication 117A, Guidelines for Evaluation and Mitigating Seismic Hazards in California (California Geological Survey 2008), contains guidance for the evaluation and mitigation of earthquake hazards for projects within designated zones of required investigations.

##### California Building Code

The California Building Code (CBC; CCR Title 24, Part 2) encompasses a number of requirements related to geologic issues. Specifically, these include general provisions (Chapter 1); structural design, including soil and seismic loading (Chapters 16/16A); structural tests and special inspections, including seismic resistance (Chapters 17/17A); soils and foundations (Chapters 18/18A); concrete (Chapters 19/19A); masonry (Chapters 21/21A); wood, including consideration of seismic design categories (Chapter 23); construction safeguards (Chapter 33); and grading, including excavation, fill, drainage, and erosion control criteria (Appendix J). The CBC encompasses standards from other applicable sources, including

the International Building Code as outlined below, and ASTM International, with appropriate amendments and modifications to reflect site-specific conditions and requirements in California.

#### 4.4.2.2 Local

### City of La Mesa Building Code

La Mesa Municipal Code Title 14, Building Regulations, sets forth rules, regulations, and minimum standards for buildings, grading, and construction activities that take place in the City. Section 14.04.010 adopts the 2019 Edition of the CBC as the building code of the City of La Mesa that serves to regulate the erection, construction, alteration, enlargement, movement, repair, removal, demolition, occupancy, conversion, equipment, use, height, area, and maintenance of all buildings or structures.
Section 14.05.010 adopts Appendix J of the CBC, 2019 Edition, for the purpose of prescribing regulations governing the excavation and grading on private property, including the issuance of permits and providing inspections.

### General Plan Safety Element

The Safety Element of the General Plan (City 2012a) identifies a number of applicable goals, objectives, and policies related to seismic, geologic, and structural considerations. Specifically, Goal SE-3 calls for protection from adverse effects caused by earthquakes and other seismic hazards. Objective SE-3.1 promotes ongoing efforts to improve the seismic safety of buildings and structures, and Policy SE-3.1.1 is to apply and enforce seismic design standards and building construction codes for new development.

## 4.4.3 Methodology and Assumptions

The Geotechnical Investigation is based upon a field investigation consisting of testing conducted during multiple site visits. Nine cone penetrometer tests were placed on the project site on March 26, 2004. The cone penetrometer measurements extended up to a maximum depth of eight feet and were performed to aid in evaluating soil types, basic strength parameters, and the liquefaction potential of existing subsurface soils. Three exploratory trenches were conducted at the site on April 26, 2004, and two supplemental drilling borings within the site were performed on July 24, 2018. The trenches and borings were performed on the site where the proposed structures and improvements are proposed to be located, and where feasible due to the existing structures and utilities currently on the site. The soil within the trenches was logged, and both bulk and in-situ soil samples were taken of the predominant soils during the investigation. The results of the field investigation are summarized in the Geotechnical Investigation found in Appendix F of this EIR (Geotechnical Exploration, Inc. 2004, 2018, 2019).

Additionally, relevant information from the California Department of Conservation and the California Geological Survey, as well as relevant maps and geologic documentation, were reviewed.

## 4.4.4 Significance Thresholds

According to Appendix G of the CEQA Guidelines, a significant impact associated with geology and soils would occur if implementation of the proposed project would result in any of the following:

1. Would the project directly or indirectly cause substantial adverse effects, including the risk of loss, injury, or death involving rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or

based on other substantial evidence of a known fault; strong seismic ground shaking; seismic-related ground failure, including liquefaction; or landslides?

2. Would the project result in substantial soil erosion or the loss of topsoil?

3. Would the project be located on a geological unit or soil that is unstable as a result of the project, and potentially result in on-site or off-site landslides, lateral spreading, subsidence, liquefaction, or collapse?

4. Would the project be located on an expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?

## 4.4.5 Impact Analysis

### 4.4.5.1 Seismic Hazards

*Threshold 1: Would the project directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault; strong seismic ground shaking; seismic-related ground failure, including liquefaction; or landslides?*

#### Ground Rupture

Ground rupture is characterized by bedrock slippage along an established earthquake fault and may result in the displacement of the ground surface. For ground rupture to occur along a fault, an earthquake typically must exceed a magnitude of 5.0. The project site is not underlain by a known active or potentially active fault. Therefore, the potential for ground surface rupture is considered to be low and it is unlikely that implementation of the proposed project would directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving ground rupture. Impacts would be less than significant.

#### Ground Shaking

The project site could potentially be subject to relatively high levels of ground shaking and site acceleration in the event of an earthquake on any of the major active faults in the region, most notably the Rose Canyon fault (refer to Table 4.4-1). The intensity of ground shaking at any specific site and relative potential for damage from this hazard depends on the earthquake magnitude, distance from the source (epicenter), and the site response characteristics (ground acceleration, predominant period, and duration of shaking). Ground shaking can affect the integrity of surface and subsurface facilities such as structures, foundations, and utilities, either directly from vibration-related damage to rigid structures, or indirectly through associated hazards including liquefaction (as described below). The Rose Canyon fault is the dominant source of potential ground motion at the project site. The estimated maximum source

of potential earthquake magnitude for the Rose Canyon fault is 7.5, and the calculated site acceleration corresponding to a 10 percent probability of exceedance in 50 years is 0.20g.[1]

In the event of a major earthquake, the project site and proposed buildings could be subject to moderate to strong ground shaking, which has the potential to damage or destroy buildings and other structures, thereby exposing people to hazardous conditions. However, pursuant to La Mesa Municipal Code Title 14, the proposed project would be designed and constructed in compliance with the CBC, which contains specific structural requirements for seismic safety. Proper engineering and adherence to the CBC guidelines would minimize the risk to life and property from potential ground motion at the project site. Therefore, the project would not directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving ground shaking. Impacts would be less than significant.

### Liquefaction

Liquefaction typically occurs in areas with loose, saturated sands and silts when they are shaken by an earthquake of sufficient magnitude. The occurrence of liquefaction under the described conditions results in a rapid pore-water pressure increase and a corresponding loss of shear strength, with affected soils behaving as a viscous liquid. Surface manifestations from these events can include effects such as a loss of bearing capacity for structures/foundations, ground subsidence, differential settlement (different degrees of settlement over relatively short distances), and lateral spreading (horizontal displacement on sloped surfaces as a result of underlying liquefaction). Lateral spreads develop on gentle slopes and entail the sidelong movement of large masses of soil as an underlying layer liquefies. Loss of bearing strength results when the soil supporting structures liquefies and causes structures to collapse. Loosely structured soils, such as alluvium or improperly compacted fill, are more susceptible to liquefaction, while clay-rich, well-compacted soils are less susceptible to liquefaction. A high groundwater table increases the risk of liquefaction hazard.

The Geotechnical Investigation (Geotechnical Exploration, Inc. 2004, 2018, 2019) concludes that the potential for liquefaction at the project site is minimal due to the dense nature of the underlying formational materials associated with the Stadium Conglomerate. Although groundwater was encountered on the site at a relatively shallow depth of three feet, it would not increase the potential for liquefaction to occur based on the characteristics of the underlying geologic formation. No loss of strength is anticipated to occur to the on-site soils due to an anticipated seismic event. Therefore, it is unlikely that implementation of the proposed project would expose people or structures to substantial adverse effects involving liquefaction. Impacts would be less than significant.

### Landslides

Landslides occur when rock, earth, or debris move down a slope, including rock falls, deep failure of slopes, and shallow debris flows. Landslides and other slope failures may occur in hillside areas due to several factors including seismic ground shaking or substantial rainfall. Structures, engineered slopes, roadways, utilities, and people located on or below unstable areas could be subject to severe damage or injury. Landslide, debris flows, and surficial material failures affect the area where the material originates, as well as downslope areas where the landslide debris accumulates.

[1] Ground acceleration is expressed in units of acceleration due to gravity (g), where 1 g corresponds to the vertical acceleration force due to gravity.

According to the Geotechnical Investigation, the project area is underlain by generally flat bedding and lacks steep slopes. The proposed project would follow the construction recommendations provided by the Geotechnical Investigation and CBC requirements, which would avoid potential slope failure and/or landslide hazards. Therefore, it is unlikely that implementation of the proposed project would expose people or structures to substantial adverse effects from seismic-induced landslides. Impacts would be less than significant.

### 4.4.5.2 Soil Erosion

*Threshold 2: Would the project result in substantial soil erosion or the loss of topsoil?*

The proposed project may result in or indirectly accelerate erosion on the project site during construction. Ground-disturbing activities, such as grading and excavation, and stockpiling of excavated materials would expose bare soils that could be eroded by wind or water. Furthermore, vegetation removal could reduce soil cohesion and temporarily diminish the buffer provided by vegetation from wind, water, and surface disturbance, causing the exposed soils to be more susceptible to erosion.

Construction activities would comply with the CBC, which regulates excavation, construction of foundations and retaining walls, and grading, including drainage and erosion control. As discussed in Section 4.1, *Air Quality*, SDAPCD Rule 55 requires that construction activities implement fugitive dust control measures, which would minimize the effects of wind erosion. As discussed in Section 4.7, *Hydrology and Water Quality*, erosion and sedimentation control BMPs would be implemented as part of the site-specific Storm Water Pollution Prevention Plan (SWPPP) developed pursuant to the NPDES Construction General Permit and the City's Storm Water BMP Manual, which would minimize the effects of water erosion.

Although it is anticipated that the proposed project would be constructed in two phases, grading of the entire project site may occur during the first phase with the development of the second phase improvements (Building 4 and associated improvements on the portion of the site east of Alvarado Creek) occurring much later, thereby leaving graded areas exposed during the interim period. All graded areas that would not be developed immediately would remain subject to the SDAPCD Rule 55, NPDES Construction General Permit, and City's Storm Water BMP Manual until permanently stabilized in accordance with the standards contained within these regulations. As indicated above, compliance with these regulations requires the implementation of dust control measures and construction BMPs, which include provisions for the stabilization of inactive disturbed areas and graded slopes. Stabilization methods include hydroseeding, soil binders, chemical soil stabilizers, geotextiles, tarps, fencing, or other erosion control measures. Following construction of each phase, any remaining disturbed areas within that phase would be stabilized with landscaping to prevent erosion and topsoil loss. With implementation of the dust control measures and construction BMPs described above, the proposed project would not result in substantial erosion or loss of topsoil. Impacts would be less than significant.

### 4.4.5.3 Unstable Soils

*Threshold 3: Would the project be located on a geological unit or soil that is unstable as a result of the project, and potentially result in on-site or off-site landslides, lateral spreading, subsidence, liquefaction, or collapse?*

As stated above in Section 4.4.5.1, the Geotechnical Investigation does not consider landslides to be a substantial risk for the project due to the generally flat nature of the site. The project site is also not

located within a rain-induced landslide hazard area identified in the San Diego County Multi-Jurisdictional Hazard Mitigation Plan (County of San Diego 2018). The proposed project would follow the construction recommendations provided by the Geotechnical Investigation and CBC requirements, which would avoid potential slope failure and/or landslide hazards. Additionally, the risk of liquefaction is minimal due to the dense nature of the site's underlying formational material below three feet in depth. As a result, lateral spreading is not considered to be a substantial risk because it is often caused by earthquake-induced liquefaction.

According to the Geotechnical Investigation (Geotechnical Exploration, Inc. 2004, 2018, 2019), the underlying formational materials (i.e., Stadium Conglomerate) would provide adequate support for the proposed structures and improvements. However, the existing artificial fill and stream deposits on the site within the first nine feet of depth are not considered suitable in their current condition to provide a stable soil base to support the proposed structures and improvements. In the areas of the proposed garages, the fill and stream deposits would be removed during excavation. The Geotechnical Investigation recommends these soils be removed and recompacted as part of the site preparation prior to the addition of any new fill or structural improvements. Adherence to the recommendations contained in the Geotechnical Investigation, which will be required as project conditions of approval and incorporated into the construction contract specifications, would avoid impacts related to unstable soils. Therefore, although shallow underlying soils may not be suitable to provide a stable base for the proposed development, adherence to the measures in the Geotechnical Investigation would ensure that the project would not result in landslides, lateral spreading, subsidence, liquefaction, or collapse. Impacts would be less than significant.

#### 4.4.5.4 Expansive Soils

*Threshold 4: Would the project be located on an expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?*

Expansion of soils may result in unacceptable settlement or heave of structures or concrete slabs supported on grade. Changes in soil moisture content can result from precipitation, landscape irrigation, utility leakage, roof drainage, perched groundwater, drought, or other factors. Soils with a relatively high fines content (clays dominantly) are generally considered expansive or potentially expansive.

According to the Geotechnical Investigation (Geotechnical Exploration, Inc. 2004, 2018, 2019), soils at the project site are considered to have a very low to low expansion potential. Adherence to the recommendations contained in the Geotechnical Investigation, which will be required as project conditions of approval and incorporated into the construction contract specifications, would avoid impacts related to expansive soils. Therefore, impacts associated with expansive soils would be less than significant.

### 4.4.6 Mitigation Measures

#### 4.4.6.1 Seismic Hazards

No significant impacts related to seismic hazards would result from the implementation of the proposed project. Therefore, no mitigation measures are required.

#### 4.4.6.2 Soil Erosion

No significant impacts related to soil erosion and topsoil loss would result from the implementation of the proposed project. Therefore, no mitigation measures are required.

#### 4.4.6.3 Unstable Soil

No significant impacts related to unstable soil would result from the implementation of the proposed project. Therefore, no mitigation measures are required.

#### 4.4.6.4 Expansive Soil

No significant impacts related to expansive soil would result from the implementation of the proposed project. Therefore, no mitigation measures are required.

### 4.4.7 Significance Determination

The significance of impacts to geology and soils before and after mitigation is summarized in Table 4.4-2, *Significance Determination Summary of Geological Impacts.* Implementation of the proposed project would not result in any significant impacts to geology and soils. Impacts related to seismic hazards, soil erosion, unstable soils, and expansive soils would be less than significant with adherence to applicable regulatory/industry standard and codes, including the CBC, NPDES requirements, and recommendations contained in the Geologic Investigation prepared for the project. No mitigation is required.

**Table 4.4-2**
**SIGNIFICANCE DETERMINATION SUMMARY OF GEOLOGICAL IMPACTS**

| Issue | Significance Before Mitigation | Mitigation Measure | Significance After Mitigation |
|---|---|---|---|
| Seismic Hazards | Less than significant | None required | Less than significant |
| Soil Erosion | Less than significant | None required | Less than significant |
| Unstable Soils | Less than significant | None required | Less than significant |
| Expansive Soils | Less than significant | None required | Less than significant |

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